

# Plant Document Analysis

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End of Engineering Analysis Report

## ENGINEERING SPECIFICATION ANALYSIS

*Focus Area: Roof floatation test.*

*Generated on November 25, 2025*

Below is a focused extraction (per your instruction) from the supplied Basic Engineering Design Data (EPCMD-1-DBD-GE-001) that is relevant to performing a Roof Floatation Test on floating-roof storage tanks. I list (A) the specifications in the document that are applicable to/consistent with industry requirements for performing/accepting a roof floatation test, (B) explicit measurement values found in the document, and (C) client inputs provided and additional data/clarifications that are missing (and would be required to perform a complete Roof Floatation Test analysis). I only extract items explicitly stated in the document (no inference beyond the text).

### Section 1: Accepted Specifications for Evaluation of Roof Floatation Test

- Tank design and construction shall follow API 650 for atmospheric storage tanks (document: "The design and construction of storage tank will follow API 650 for atmospheric storage tanks and API 620 for low pressure storage tanks. Modification of tank shall follow API 653.").
- Storage tank corrosion allowance requirements: shell and bottom — 1.5 mm; roof — 1.0 mm ("For storage tanks corrosion allowance shall be considered as 1.5 mm for shell and bottom. For roof, corrosion allowance shall be considered as 1 mm.").
- Floating-roof-related detection: "Gas detectors, linear heat detectors for floating roof tanks, ROR heat detectors for clean agent system shall be provided for process units and OSBL facilities as per provisions of OISD-116."
- Blanket/blanketing provision: "Nitrogen / Fuel Gas blanketing is provided when storage temperature is more than the flash point of the liquid stored to prevent air ingress in vapor space and formation of flammable atmosphere."
- Material of construction guidance: "Primary metallurgy ... will be advised by the Licensor / BEC ... Metallurgy and corrosion allowance needs to be specified considering a 20-year life

minimum." (relevant to roof materials and expected life that affect floatation test acceptance).

- Manhole and access requirements for vessels (relevant to access for inspection/test): minimum manhole ID and sizes are defined (see Section 9.7.1 Manways), e.g., minimum ID of manhole shall be 20" NB; vessel dia 900–1500 mm → 20" NB; above 1500 mm → 24" NB. (While this refers to vessels, the document establishes access sizing practice that applies to mechanical items.)

- Vent and drain nozzle sizing guidance for vessels: provides vent and drain nozzle NB sizing by volume (vent: up to 6 m<sup>3</sup> → 1½"; above 6 m<sup>3</sup> → 2"; drain: up to 6 m<sup>3</sup> → 1½"; 6.1–15 m<sup>3</sup> → 2"; above 15 m<sup>3</sup> → 3"). (Relevant to tank roof drain/vent sizing references where applicable.)

- Equipment design life: design life of all J3 units is set as 20 years (applies to tankage and roof life assumptions).

## **Section 2: Measurements Provided in Document**

- Corrosion allowance for storage tank shell and bottom: 1.5 mm.
- Corrosion allowance for storage tank roof: 1.0 mm.
- Minimum manhole internal diameter: 20" NB (minimum ID of manhole shall be 20").
- Manhole sizing guidance by vessel diameter:
  - Vessel dia 900 mm to 1500 mm → 20" NB.
  - Vessel dia above 1500 mm → 24" NB.
- Vent nozzle sizes for vessels (by vessel volume):
  - Vent up to 6 m<sup>3</sup> → 1½" NB.
  - Vent above 6 m<sup>3</sup> → 2" NB.
- Drain nozzle sizes for vessels (by vessel volume):
  - Drain up to 6 m<sup>3</sup> → 1½" NB.
  - Drain 6.1–15 m<sup>3</sup> → 2" NB.
  - Drain above 15 m<sup>3</sup> → 3" NB.
- Project design life: 20 years (applies to corrosion allowance selection).
- Codes and standards explicitly required: API 650, API 620, API 653, ASME Section VIII (for vessels/pressure items) — API 650 and API 653 explicitly for tankage.
- Safety detection requirement: floating roof tanks to have linear heat detectors / gas detectors per OISD-116 (explicit).

## **Section 3: Inputs and Additional Requirements from Client (explicit in document and missing items needed for a complete Roof Floatation Test)**

- Applicable tank codes: API 650 (atmospheric tanks), API 620 (low-pressure tanks), API 653 (modification/inspection).
- Corrosion allowance values for storage tank shell/bottom and roof (see Section 2).
- Requirement for detectors on floating roof tanks per OISD-116.
- Blanketing policy: nitrogen/fuel-gas blanketing when storage temperature exceeds flash point.
- The document states tank design details will be provided by Licensor / BEC and finalized by DEC/OSBL designer; where no numbers are provided, the OSBL designer shall populate the tables as design evolves — therefore the following specific items required for a roof floatation test are NOT provided in this document and must be supplied:
  - Tank identification (tag), tank capacity / dimensions (diameter, shell height), and floating roof type (internal vs external, pontoon vs double-deck, rim seal type).
  - Product(s) stored in the tank and precise physical properties (density / specific gravity at operating temperature, flash point, viscosity) — necessary to compute roof buoyancy, freeboard, and submerged weight.
  - Roof dry weight and distribution (deck weight, supported attachments, roof fittings) and any added loads (manways, ladders, seal systems, roof-mounted equipment).
  - Seal type and geometry (primary/secondary rim seals, flotation seal arrangement) and expected seal friction/loading.
  - Design and operating liquid levels (normal, maximum filling level, ullage height) and expected transient levels for test setup.
  - Roof drain/venting arrangement specifics for the tank (locations, sizes, valve arrangement) beyond the general vessel nozzle guidance.
  - Details of roof rests/legs and their clearances/adjustability and leg guides.
  - Roof buoyancy calculations or vendor data (pontoon buoyancy, displacement) or manufacturer's test procedure if vendor-supplied roof.
  - Hydrostatic / pneumatic test pressures (if applicable) and test acceptance criteria for roof movements—document does not give test pressures or acceptance criteria.
  - Specific inspection & safety interlocks required during floatation test (e.g., gas monitoring limits, safety watch, isolation) beyond the general detector requirement.
  - Environmental limits for testing (temperature, wind limits) — site wind and temperature data are available in the document, but the document does not state permitted wind for conducting roof floatation tests.
  - Any required instrumentation setpoints or monitoring points for the test (level measurement locations, differential pressure, roof elevation measurement method).
  - Regulatory / local authority / PESO specific requirements for storage of the particular product (document references PESO but no tank-specific PESO constraints provided).

- Acceptance criteria for float test (e.g., acceptable tilt, leakage, seal set, drainage performance), and pass/fail criteria — not included.
- Requirement for blanketing operation during the test (if blanketing gas must be maintained or isolated) — policy stated, but test procedure details not provided.
- QA/QC documentation and reporting format required by Owner/PMT for roof floatation test records (document states documentation requirements generally but not float test specifics).
- “The tanks shall be designed considering a specific gravity of fluid stored as 0.9 minimum if the specific gravity is of lesser magnitude and test fluid specific gravity as 1.0 to allow for water fill test.” — this line indicates that where product SG is  $<0.9$ , a water-fill test (SG = 1.0) is used for testing; the document explicitly states water-fill test SG assumption (this is directly relevant to floatation tests done by filling).
- Codes precedence: Indian statutory rules and then project specifications and international codes — use this to confirm which standards to follow when executing tests.
- Prepare a checklist of the exact data and drawings to request from Licensor/DEC/Owner so the roof floatation test can be executed and documented (e.g., tank GA, roof vendor test procedure, roof weight & pontoon buoyancy data, tank product properties, ullage limits, required instrumentation).
- Draft a template Roof Floatation Test procedure (step-by-step) aligned to API 650/653 and the requirements already present in this BEDD (noting items that must be filled by you from vendor/tank data).

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